March 11, 2002

James Duck
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Planning Division
Environmental Branch
Post Office Box 4970
Jacksonville, Florida 32232-0019

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| Service Log No.: | 4-1-99-I-506 |
| Application No.: | 99905545 (IP-DSG) |
| Dated: | April 26, 2000 |
| Project : | Broward County Shore Protection Project |
| Applicant: | Broward County Department of Planning and Environmental Protection |
| County: | Broward |

Dear Mr. Duck:

This document transmits the Fish and Wildlife Service's (Service) Biological Opinion for the Broward County Shore Protection Project located in Broward County, Florida. The proposed project may affect the threatened loggerhead sea turtle (*Caretta caretta*), the endangered leatherback sea turtle (*Dermochelys coriacea*), and the endangered green sea turtle (*Chelonia mydas*). The proposed project may affect, but is not likely to adversely affect the endangered West Indian manatee (*Trichechus manatus*). The biological opinion, in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq*.), provides an evaluation of the project effects to listed species.

This biological opinion is based on information in the Service's files, information in the Public Notice referenced above, and information provided to the Service by the Florida Fish and Wildlife Conservation Commission (FWC), the Florida Department of Environmental Protection (DEP), and the Broward County Department of Planning and Environmental Protection (Broward County). A complete administrative record of this consultation is on file at the South Florida Ecological Services Field Office, Vero Beach, Florida.

CONSULTATION HISTORY

The Service received a letter dated September 24, 1999, from the U.S. Army Corps of Engineers (Corps) requesting a list of any species or their critical habitat either listed or proposed for listing that may be present in the study area for the Broward County Shore Protection Project, Segments II and III, Broward County, Florida.

The Service provided in a letter dated October 19, 1999, with a list of the federal species likely to be present in the project area. The species list includes the endangered West Indian manatee, the endangered hawksbill sea turtle, the endangered leatherback sea turtle, the endangered green sea turtle, and the threatened loggerhead sea turtle. No critical habitat has been designated in the project vicinity.

The Service received in a letter dated November 8, 1999, a request from the Department of Interior, Office of Secretary, to provide technical assistance to the Federal Register Notice for the Corps "Intent to Prepare a Draft Environmental Impact Statement for the Broward County Shore Protection Project, Broward County, Florida." A copy of the October 19, 1999, technical assistance letter was provided.

The Service received a letter dated February 3, 2000, from the Corps Planning Division requesting formal consultation for a may affect determination for nesting sea turtles.

The Service received a Reimbursement Agreement Authorization from the Corps, dated April 26, 2000, to prepare a Fish and Wildlife Coordination Act (FWCA) Report for the proposed Federal project.

The Service received the Corps' Public Notice, dated April 26, 2000, from the Corps Regulatory Division requesting comments on a federal permit application [199905545 (IP-DSG)] for Broward County for the proposed beach nourishment. The Corps made the determination in the letter of may affect, but not likely to adversely affect the West Indian manatee, provided that the standard manatee construction precautions are followed. The Corps also made the determination in the letter of may affect, but not likely to adversely affect the listed sea turtles. The Corps also noted that the applicant wishes to nourish the beaches during the nesting season.

The Service provided in a letter dated May 26, 2000, concurrence with the Corps determination of may affect, but not likely to adversely affect the West Indian manatee. However, the Service could not provide concurrence with the may affect, not likely to adversely affect determination for listed sea turtles. The Service requested additional information on the project's effects on listed sea turtles in order to determine if formal consultation was warranted in accordance with regulations governing interagency consultations (51 CFR 402.14). The letter identified project specific resource evaluation needs to assess the project's impacts.

In the May 26, 2000, letter, the Service recommended denial of the project as proposed and notified the Corps, in accordance with the procedural requirements of the 1992 404(q) MOA Part IV, 3(a) between the Service and the Corps, that the proposed work may affect aquatic resources of national importance.

The Service received correspondence from both the Florida Fish and Wildlife Conservation Commission (May 26, 2000), the Federal Environmental Protection Agency (May 26, 2000), and the National Marine Fisheries Service (May 24, 2000), also noting potential resource impacts from the proposed project.

The Service received correspondence from Broward County dated June 28, 2000, requesting relaxation of the sea turtle related construction window for beach nourishment activities for the beaches of Hollywood and Hallandale in south Broward County, Florida. For nourishment projects in Brevard County, Florida, south through Broward County, Florida, nourishment will not be allowed during the main part of the nesting season (March 1 through October 31). This timing restriction has been agreed to by the U.S. Army Corps of Engineers Jacksonville District as documented in a December 22, 1994, letter from A.J. Salem, Chief, Planning Division.

The Service provided in a letter dated July 24, 2000, outlining data needs necessary to evaluate the request to relax the construction window restrictions.

The Service received correspondence from the Corps dated July 28, 2000, transmitting side scan and bathymetric survey data.

The Service received additional information from the County, dated August 31, 2000, addressing some of the Service's data needs.

The Service received from the Florida Department of Environmental Protection data evaluations of the August submittal and remaining outstanding data needs and clarifications.

The Service provided an E-mail, dated January 5, 2001, to the County and the Corps requesting clarification of turtle nesting data, the closed season nourishment request, the location of the pipeline corridors, sediment profiles, monitoring plans, nearshore habitat descriptions, and temporal lag mitigation proposals.

The Service received additional information from the Corps in correspondence dated February 5, 2001.

The Service received additional data from the County, dated February 7, 2001, addressing Service issues.

The Service received correspondence from the Corps, dated March 5, 2001, requested a project change to conduct beach nourishment during the summer sea turtle nesting season.

The Service provided an E-mail, dated May 22, 2001, requesting data clarification of the sand durability, mitigation proposal, and temporal lag questions.

The Service requested in an E-mail, dated June 19, 2001, electronic copies of the draft sections of the Draft Environmental Impact Statement to facilitate the preparation of the FWCA Report.

The Service received an E-mail, dated June 20, 2001, from the County providing additional data on the sand durability.

The Service received an E-mail, dated July 16, 2001, from the County on the Corps' request to nourish during the nesting season for the southern portion of the County. The County provided clarification of the nesting data densities.

The Service provided an E-mail, dated July 23, 2001, to the Corps and the County on Coastal Barrier Resource Act designations for portions of John U. Lloyd Beach State Recreation Area. The Service also requested clarification of the pipeline corridor survey protocol and turbidity plume issues within the 200-foot buffer area boundaries around the proposed borrow areas.

The Service received a report from Broward County, dated July 27, 2001, that provided an evaluation of the need for the T-groins, the erosion rates of the beach south of the inlet, and the sea turtle nesting activities in the proposed groin field. The report recommends three groins, instead of the ten originally proposed.

The Service attended a presentation by the County on July 31, 2001. The presentation provided an update of the project, the ongoing additional data surveys of the biological resources, and the projected completion date of the data surveys.

The Service provided, in an E-mail dated August 16, 2001, a request to the County to evaluate the sediment and turbidity monitoring program being used by Miami-Dade County and its applicability to the current project.

The Service attended the Corps' Alternative Formulation Briefing, which was held on August 29, 2001.

The Service received additional data from the County, dated September 6, 2001.

The Service met with the County on September 19, 2001, to discuss the turbidity and sediment monitoring programs and to discuss the status of the biological data.

The Service received additional data from the County, dated November 9, 2001. The data included biological survey reports, monitoring proposals, and project minimization objectives.

The Service met with Broward County on November 28, 2001, to review the monitoring data and to review the proposed changes in the project scope. The changes were made, based on the biological survey reports.

The Service received a revised monitoring plan from the County, dated December 17, 2001. The plan included monitoring of stress indicators, as well as, physical measurements of sedimentation rates.

The Service received correspondence from the County, dated December 18, 2001, deleting several of the proposed borrow areas and proposing changes in the boundaries of others.

The Service received additional information from the County, dated January 14, 2001, on sediment profiles in Borrow Area III.

Through preparation of this Biological Opinion, the Service is initiating formal consultation with the Corps.

## BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The Army Corps of Engineers (Corps) published in the Federal Register (FR Vol. 64, No. 209, Friday October 29, 1999, pp 58381- 58382) its intent to prepare a Draft Environmental Impact Statement for the construction of appropriate reaches of Segments II and Segments III of the Broward County Shore Project (Noticed Project). The Noticed Project involves the placement of approximately 3.5 million cubic yards of material along 17.35 miles of Broward County's coast line. The Noticed Project was authorized by Public Law (PL) 79 Stat. 1073, Public Works - River and Harbor, which was passed in October 27, 1965. Three separate segments were identified in the authorizing document. The proposed action addresses only Segments II and III. Segment I is not included in the proposed action. Reevaluations of Sections II and III were also authorized by Section 156 of the Water Resource Development Act (WRDA) of 1976 (PL 99-62), as amended by Section 934 of the WRDA 1986 (PL 99-662). The reevaluations were completed in April 1994 and April 1991, respectively.

The Noticed Project would impact approximately 25 acres of nearshore hardbottom, would include the construction of 13 shore stabilization groins south of the south jetty of Port Everglades, and would require dredge material from seven borrow areas. Biological resource surveys noted significant benthic flora and fauna in the proposed project impact areas. Physical surveys of the borrow areas also noted sediment quality concerns with several of the sites. As a result of these concerns, the Noticed Project was reduced in size and scope (Revised Project).

The Revised Project (Figure 1) proposes impacts to 13.6 acres of nearshore hardbottom, proposes the construction of three groins, and proposes to dredge material from five borrow areas. The project also includes the removal of 18 to 20 derelict structures. The Revised Project will place approximately 2.5 million cubic yards of material along 11.8 miles of beach. Mitigation for nearshore hardbottom impacts is proposed by placing limestone boulders in similar nearshore areas. Mitigation will consist of the creation of artificial reef habitat at a 1:1 footprint ratio. Secondary impacts from turbidity and sediment plumes may also occur from project implementation. The Corps has proposed turbidity and sediment monitoring programs to document the occurrence of both short-term and long-term turbidity and sediment effects. The short-term monitoring program includes both preventative and corrective actions that can be implemented should resource effects occur. The long-term monitoring is a continuation of the County's current countywide sea turtle nest and reef monitoring program.

Segment II is from Hillsboro Inlet to Port Everglade; fill will be placed along beaches in southern Pompano Beach, Lauderdale-by-the-Sea, and northern and central Fort Lauderdale. In Segment III, which is from Port Everglades to the south County line, fill will be placed on beaches in John U. Lloyd Beach State Recreation Area, Dania Beach, Hollywood, and Hallandale Beach. Fill will be obtained from five discrete borrow areas located offshore of the central and northern portions of the County. The project also includes the installation of three groins on the downdrift shore of Port Everglades Inlet. The sections of beach in Dania, Hollywood, and Hallandale (DEP Monuments R98 to R128) are proposed for nourishment during the normally closed summer sea turtle nesting season (May 1 through October 31).

STATUS OF THE SPECIES/CRITICAL HABITAT

Species description

Loggerhead Sea Turtle

The loggerhead sea turtle (*Caretta caretta*), listed as a threatened species on July 28, 1978 (43 FR 32800), inhabits the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian Oceans. Loggerhead sea turtles nest within the continental U.S. from Louisiana to Virginia. Major nesting concentrations in the U.S. are found on the coastal islands of North Carolina, South Carolina, and Georgia, and on the Atlantic and Gulf coasts of Florida (Hopkins and Richardson 1984). No critical habitat has been designated for the loggerhead sea turtle.

Green Sea Turtle

The green sea turtle (*Chelonia mydas*) was federally listed as a protected species on July 28, 1978 (43 FR 32800). Breeding populations of the green turtle in Florida and along the Pacific Coast of Mexico are listed as endangered; all other populations are listed as threatened. The green turtle has a worldwide distribution in tropical and subtropical waters. Major green turtle nesting colonies in the Atlantic occur on Ascension Island, Aves Island, Costa Rica, and Surinam. Within the U.S., green turtles nest in small numbers in the U.S. Virgin Islands and Puerto Rico, and in larger numbers along the east coast of Florida, particularly in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991a). Nesting also has been documented along the Gulf coast of Florida on Santa Rosa Island (Okaloosa and Escambia Counties) and from Pinellas County through Collier County (Florida Department of Environmental Protection, unpublished data). Green turtles have been known to nest in Georgia, but only on rare occasions (Georgia Department of Natural Resources, unpublished data). The green turtle also nests sporadically in North Carolina and South Carolina (North Carolina Wildlife Resources Commission, unpublished data; South Carolina Department of Natural Resources, unpublished data). Unconfirmed nesting of green turtles in Alabama has also been reported (Bon Secour National Wildlife Refuge, unpublished data). Critical habitat for the green sea turtle has been designated for the waters surrounding Culebra Island, Puerto Rico, and its outlying keys.

Leatherback Sea Turtle

The leatherback sea turtle (*Dermochelys coriacea*), listed as an endangered species on June 2, 1970 (35 FR 8491), nests on shores of the Atlantic, Pacific and Indian Oceans. Non-breeding animals have been recorded as far north as the British Isles and the Maritime Provinces of Canada and as far south as Argentina and the Cape of Good Hope (Pritchard 1992). Nesting grounds are distributed worldwide, with the Pacific Coast of Mexico supporting the world's largest known concentration of nesting leatherbacks. The largest nesting colony in the wider Caribbean region is found in French Guiana, but nesting occurs frequently, although in lesser numbers, from Costa Rica to Columbia and in Guyana, Surinam, and Trinidad

(National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992, National Research Council 1990a).

The leatherback regularly nests in the U.S. in Puerto Rico, the U.S. Virgin Islands, and along the Atlantic coast of Florida as far north as Georgia (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992). Leatherback turtles have been known to nest in Georgia, South Carolina, and North Carolina, but only on rare occasions (Murphy 1996, Winn 1996, Boettcher 1998). Leatherback nesting also has been reported on the northwest coast of Florida (LeBuff 1990; Florida Department of Environmental Protection, unpublished data); a false crawl (non-nesting emergence) has been observed on Sanibel Island (LeBuff 1990). Marine and terrestrial critical habitat for the leatherback sea turtle has been designated at Sandy Point on the western end of the island of St. Croix, U.S. Virgin Islands.

Life history

Loggerhead Sea Turtle

Loggerheads are known to nest from one to seven times within a nesting season (Talbert *et al*. 1980, Richardson and Richardson 1982, Lenarz *et al*. 1981, among others); the mean is approximately 4.1 (Murphy and Hopkins 1984). The interval between nesting events within a season varies around a mean of about 14 days (Dodd 1988). Mean clutch size varies from about 100 to 126 along the southeastern United States coast (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b). Nesting migration intervals of 2 to 3 years are most common in loggerheads, but the number can vary from 1 to 7 years (Dodd 1988). Age at sexual maturity is believed to be about 20 to 30 years (Turtle Expert Working Group 1998).

Green Sea Turtle

Green turtles deposit from one to nine clutches within a nesting season, but the overall average is about 3.3. The interval between nesting events within a season varies around a mean of about 13 days (Hirth 1997). Mean clutch size varies widely among populations. Average clutch size reported for Florida was 136 eggs in 130 clutches (Witherington and Ehrhart 1989). Only occasionally do females produce clutches in successive years. Usually 2, 3, 4, or more years intervene between breeding seasons (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991a). Age at sexual maturity is believed to be 20 to 50 years (Hirth 1977).

Leatherback Sea Turtle

Leatherbacks nest an average of five to seven times within a nesting season, with an observed maximum of 11 (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992). The interval between nesting events within a season is about 9 to 10 days. Clutch size averages 101 eggs on Hutchinson Island, Florida (Martin 1992). Nesting migration intervals of 2 to 3 years were observed in leatherbacks nesting on the Sandy Point National Wildlife Refuge, St. Croix, U.S. Virgin Islands (McDonald and Dutton 1996). Leatherbacks are believed to reach sexual maturity in 6 to 10 years (Zug and Parham 1996).

Population dynamics

Loggerhead Sea Turtle

Total estimated nesting in the Southeast is approximately 50,000 to 70,000 nests per year (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b). In 1998, there were over 80,000 nests in Florida alone. From a global perspective, the southeastern U.S. nesting aggregation is of paramount importance to the survival of the species and is second in size only to that which nests on islands in the Arabian Sea off Oman (Ross 1982, Ehrhart 1989, National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b). The status of the Oman colony has not been evaluated recently, but its location in a part of the world that is vulnerable to disruptive events (e.g., political upheavals, wars, catastrophic oil spills) is cause for considerable concern (Meylan *et al*. 1995). The loggerhead nesting aggregations in Oman, the southeastern U.S., and Australia account for about 88 percent of nesting worldwide (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b). About 80 percent of loggerhead nesting in the southeastern U.S. occurs in six Florida counties (Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties) (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b). In the years 1999 and 2000 about 94 percent of the loggerhead nesting occurred in the 6 counties mentioned (Brevard south through Broward) (Florida Fish and Wildlife Conservation Commission 2001).

Green Sea Turtle

About 200 to 1,100 females are estimated to nest on beaches in the continental U.S. In the U.S. Pacific, over 90 percent of nesting throughout the Hawaiian archipelago occurs at the French Frigate Shoals, where about 200 to 700 females nest each year. Elsewhere in the U.S. Pacific, nesting takes place at scattered locations in the Commonwealth of the Northern Marianas, Guam, and American Samoa. In the western Pacific, the largest green turtle nesting aggregation in the world occurs on Raine Island, Australia, where thousands of females nest nightly in an average nesting season. In the Indian Ocean, major nesting beaches occur in Oman where 6,000 to 20,000 females are reported to nest annually.

Leatherback Sea Turtle

Recent estimates of global nesting populations indicate 26,000 to 43,000 nesting females annually (Spotila *et al*. 1996). The largest nesting populations at present occur in the western Atlantic in French Guiana (4,500 to 7,500 females nesting/year) and Colombia (estimated several thousand nests annually), and in the western Pacific in West Papua (formerly Irian Jaya) and Indonesia (about 600 to 650 females nesting/year). In the United States, small nesting populations occur on the Florida east coast (35 females/year), Sandy Point, U.S. Virgin Islands (50 to 100 females/year), and Puerto Rico (30 to 90 females/year).

Status and distribution

Loggerhead Sea Turtle

Genetic research (mtDNA) has identified four loggerhead nesting subpopulations in the western North Atlantic: (1) the Northern Subpopulation occurring from North Carolina to around Cape Canaveral, Florida (about 29° N.); (2) South Florida Subpopulation occurring from about 29° N. on Florida's east coast to Sarasota on Florida's west coast; (3) Northwest Florida Subpopulation occurring at Eglin Air Force Base and the beaches near Panama City; and (4) Yucatán Subpopulation occurring on the eastern Yucatán Peninsula, Mexico (Bowen 1994, 1995; Bowen *et al*. 1993; Encalada *et al*. 1998). These data indicate that gene flow between these four regions is very low. If nesting females are extirpated from one of these regions, regional dispersal will not be sufficient to replenish the depleted nesting subpopulation. The Northern Subpopulation has declined substantially since the early 1970s, but most of that decline occurred prior to 1979. No significant trend has been detected in recent years (Turtle Expert Working Group 1998, 2000). Adult loggerheads of the South Florida Subpopulation have shown significant increases over the last 25 years, indicating that the population is recovering, although a trend could not be detected from the State of Florida's Index Nesting Beach Survey program from 1989 to 1998. Nesting surveys in the Northwest Florida and Yucatán Subpopulations have been too irregular to date to allow for a meaningful trend analysis (Turtle Expert Working Group 1998, 2000).

Threats include incidental take from channel dredging and commercial trawling, longline, and gill net fisheries; loss or degradation of nesting habitat from coastal development and beach armoring; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and non-native predators; degradation of foraging habitat; marine pollution and debris; watercraft strikes; and disease. There is particular concern about the extensive incidental take of juvenile loggerheads in the eastern Atlantic by longline fishing vessels from several countries.

Green Sea Turtle

Total population estimates for the green turtle are unavailable, and trends based on nesting data are difficult to assess because of large annual fluctuations in numbers of nesting females. For instance, in Florida, where the majority of green turtle nesting in the southeastern U.S. occurs, estimates range from 200 to 1,100 females nesting annually. Populations in Surinam, and Tortuguero, Costa Rica, may be stable, but there is insufficient data for other areas to confirm a trend.

A major factor contributing to the green turtle's decline worldwide is commercial harvest for eggs and food. Fibropapillomatosis, a disease of sea turtles characterized by the development of multiple tumors on the skin and internal organs, is also a mortality factor and has seriously impacted green turtle populations in Florida, Hawaii, and other parts of the world. The tumors interfere with swimming, eating, breathing, vision, and reproduction, and turtles with heavy tumor burdens may die. Other threats include loss or degradation of nesting habitat from coastal development and beach armoring; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and non-native predators; degradation of foraging habitat; marine

pollution and debris; watercraft strikes; and incidental take from channel dredging and commercial fishing operations.

Leatherback Sea Turtle

Declines in leatherback nesting have occurred over the last two decades along the Pacific coasts of Mexico and Costa Rica. The Mexican leatherback nesting population, once considered to be the world's largest leatherback nesting population (65 percent of worldwide population), is now less than one percent of its estimated size in 1980. Spotila *et al*. (1996) recently estimated the number of leatherback sea turtles nesting on 28 beaches throughout the world from the literature and from communications with investigators studying those beaches. The estimated worldwide population of leatherbacks in 1995 was about 34,500 females on these beaches with a lower limit of about 26,200 and an upper limit of about 42,900. This is less than one third the 1980 estimate of 115,000. Leatherbacks are rare in the Indian Ocean and in very low numbers in the western Pacific Ocean. The largest population is in the western Atlantic. Using an age-based demographic model, Spotila *et al*. determined that leatherback populations in the Indian Ocean and western Pacific Ocean cannot withstand even moderate levels of adult mortality and that even the Atlantic populations are being exploited at a rate that cannot be sustained. They concluded that leatherbacks are on the road to extinction and further population declines can be expected unless we take action to reduce adult mortality and increase survival of eggs and hatchlings.

The crash of the Pacific leatherback population is believed primarily to be the result of exploitation by humans for the eggs and meat, as well as incidental take in numerous commercial fisheries of the Pacific. Other factors threatening leatherbacks globally include loss or degradation of nesting habitat from coastal development; disorientation of hatchlings by beachfront lighting; excessive nest predation by native and non-native predators; degradation of foraging habitat; marine pollution and debris; and watercraft strikes.

Analysis of the species likely to be affected

The proposed action has the potential to adversely affect nesting females, nests, and hatchlings within the proposed project area. The effects of the proposed action on sea turtles will be considered further in the remaining sections of this biological opinion. Potential effects include destruction of nests deposited within the boundaries of the proposed project, harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities, harm to nesting females and hatchlings by heavy equipment, entrapment of nesting females and hatchlings by groins, disorientation of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting, increased hatchling predation due to predator concentration at the groins, and behavior modification of nesting females due to escarpment formation within the project area during a nesting season resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs. The quality of the placed sand could affect the ability of female turtles to nest, the suitability of the nest incubation environment, and the ability of hatchlings to emerge from the nest. Critical habitat

has not been designated in the continental United States; therefore, the proposed action would not result in an adverse modification.

ENVIRONMENTAL BASELINE

Status of the species within the action area

Broward County is within the normal nesting areas of three species of sea turtles: the loggerhead sea turtle, the green sea turtle, and the leatherback sea turtle. Additionally, two of the seven hawksbill nests laid in the State of Florida between the years 1979 and 1998 were in Broward County, one nest in 1994 and one in 1997. Overall, 2,385 nests were recorded in 2001 over the 24-mile (38.6-km) beach from the Palm Beach/Broward County line south to the Broward/Dade County line. Total nests recorded for the previous four nesting seasons (2000, 1999, 1998, and 1997) were 2,942, 2,620, 2,857, and 2,285, respectively. The distribution of nests among species in 2001 was 2,320 loggerhead, 26 green, and 39 leatherback; in 2000 the distribution was 2,674 loggerhead, 255 green, and 13 leatherback; in1999 the distribution was 2,584 loggerhead, 24 green, and 12 leatherback; in 1998 the distribution was 2,643 loggerhead, 200 green, and 14 leatherback; and for 1997 the distribution was 2,216 loggerhead, 29 green, and 42 leatherback.

Two profiles of nesting densities [nests per kilometer (km)] are present in Broward County. In the northern portion of the County (DNR monument R1 to R98), nest densities average 76.2, 96.4, 83.6, and 93.5 nests per km, for the years 2001, 2000, 1999, and 1998, respectively. For the southern portion of the County (DNR monument R98 to R128) densities average 17.1, 13.6, 19.1, and 13.4 nests per km for the years 2001, 2000, 1999, and 1998, respectively. Although no specific physical/biological parameters have been identified that would account for the two nest density profiles on the Broward County beaches, preliminary research suggests that nesting females are exiting the gulf stream at this point because of its close proximity to the coast (personal communication, L. Fisher 2000). Nesting densities and false crawls for each of the three species for the two nesting profiles are presented in Tables 1 and 2.

Table 1. Sea turtle nesting and false crawl data* for Broward County Beaches from the north county line to Dania Beach Pier (DEP Monuments R1 to R98, a distance of 18.14 miles [29.2 km]), for the years 1995 to 2001.

| Year | Number of *Caretta caretta* Nests | Number of *C. caretta* False Crawls | Number of *Chelonia mydas* Nests | Number of *C. mydas* False Crawls | Number of *Dermochelys coriacea* Nests | Number of *D. coriacea* False Crawls |
|---|---|---|---|---|---|---|
| 1995 | 2428 | 2195 | 52 | 96 | 14 | 3 |
| 1996 | 2607 | 2783 | 109 | 137 | 2 | 0 |
| 1997 | 2141 | 2232 | 29 | 44 | 39 | 9 |
| 1998 | 2523 | 3807 | 196 | 253 | 12 | 5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1999 | 2406 | 2708 | 24 | 32 | 10 | 1 |
| 2000 | 2553 | 2636 | 248 | 239 | 13 | 4 |
| 2001 | 2170 | 2140 | 23 | 48 | 31 | 6 |

Table 2. Sea turtle nesting and false crawl data* for Broward County Beaches from the Dania Beach Pier to the south county line (DEP Monuments R98 to R128, a distance of 5.84 miles [9.4 km]), for the years 1995 to 2001.

| Year | Number of *Caretta caretta* Nests | Number of *C. caretta* False Crawls | Number of *Chelonia mydas* Nests | Number of *C. mydas* False Crawls | Number of *Dermochelys coriacea* Nests | Number of *D. coriacea* False Crawls |
|---|---|---|---|---|---|---|
| 1995 | 139 | 135 | 0 | 1 | 1 | 2 |
| 1996 | 89 | 154 | 3 | 6 | 0 | 0 |
| 1997 | 75 | 150 | 0 | 4 | 1 | 1 |
| 1998 | 120 | 258 | 4 | 12 | 2 | 3 |
| 1999 | 178 | 306 | 0 | 0 | 2 | 0 |
| 2000 | 121 | 135 | 7 | 9 | 0 | 0 |
| 2001 | 150 | 168 | 3 | 1 | 8 | 1 |

*Data provided by Broward County.

Groin Field Nesting Densities

Historical sea turtle nesting densities in the proposed groin field in John U. Lloyd Beach State Recreation Area range from a high of 18 nests in 1999 to a low of 2 nests in 2001. The proposed groin field extends from south of the jetty to approximately restroom #6 (RR6) (Figure 2), a distance of about 600 feet.

In general, Broward County beaches provide high quality nesting substrate for sea turtle nesting. However, because of the heavily developed nature of the County's coastline, the relative location of Highway A-1-A to the beach, and the extensive beach front lighting, all of which have the potential to negatively impact nesting sea turtles and their hatchlings, Broward County has instituted a nest relocation program. The program relocates all discovered, negatively impacted nests in portions of Pompano Beach, Deerfield Beach, Ft. Lauderdale, and Hollywood/Hallandale Beach to open-beach hatcheries that are located on darker less developed stretches of beach that are considered safe for hatchling emergence. Negatively impacted nests are those that are

(1) susceptible to tidal inundation, (2) located near a highway or artificially lighted area defined as a beach area where a worker can see his shadow on a clear night, and/or (3) located in an area subject to beach renourishment. The relocation program has been in operation since the inception of the County's sea turtle conservation program in 1978. The nest are relocated to hatcheries in Pompano Beach near Atlantic Boulevard; at the South Beach municipal parking lot in Ft. Lauderdale, and at North Beach Park in Hollywood. Nests in John U. Lloyd Beach State Recreation Area (DNR monument R86 to R97) are not relocated.

Loggerhead Sea Turtle

The loggerhead sea turtle nesting and hatching season for Broward County extends from March 15 through November 30. Incubation ranges from about 45 to 95 days. The FWC's marine turtle permit holders conduct surveys of sea turtle nesting, nesting activity, and nest relocations each year during the nesting season throughout Broward County. The number of loggerhead sea turtle nests observed during the seven year period from 1995 to 2001 ranged from a low of 2,216 in 1997 to a high of 2,696 in 1996, with an average of 2,529.

Green Sea Turtle

The green sea turtle nesting and hatching season for Broward County extends from May 1 through November 30. Incubation ranges from about 45 to 75 days. Nesting and false crawl data for green sea turtles in Broward County for each of the two nesting profiles for the years 1995 to 2001, are presented in Tables 1 and 2. The number of green sea turtle nests highs and lows are cyclic with an average of 189 nest for high years and 33 for low years. The pattern in Broward County is high nesting populations in even years and low nesting in odd years.

Leatherback Sea Turtle

The leatherback sea turtle nesting and hatching season for Broward County extends from February 15 through November 15. Incubation ranges from about 55 to 75 days. Nesting and false crawl data for leatherback sea turtles in Broward County for each of the two nesting profiles for the years 1995 to 2001, are presented in Tables 1 and 2. The number of leatherback sea turtle nests during the seven year period from 1995 to 2001 ranged from a low of 2 in 1996 to a high of 40 in 1997, with an average of 19.

EFFECTS OF THE ACTION

Analyses for effects of the action

Beneficial Effects

The placement of sand on a beach with reduced dry fore-dune habitat may increase sea turtle nesting habitat if the placed sand is highly compatible (i.e., grain size, shape, color, etc.) with naturally occurring beach sediments in the area, and compaction and escarpment remediation measures are incorporated into the project. In addition, a nourished beach that is designed and constructed to mimic a natural beach system may be more stable than the eroding one it replaces,

thereby benefitting sea turtles. The groin construction may provide stabilization to sands between the groins and provide nesting habitat where none currently exists.

Direct Effects

Placement of sand on a beach in and of itself may not provide suitable nesting habitat for sea turtles. Although beach nourishment may increase the potential nesting area, significant negative impacts to sea turtles may result if protective measures are not incorporated during project construction. Nourishment and groin construction during the nesting season, particularly on or near high density nesting beaches, can cause increased loss of eggs and hatchlings and, along with other mortality sources, may significantly impact the long-term survival of the species. For instance, projects conducted during the nesting and hatching season could result in the loss of sea turtles through disruption of adult nesting activity and by burial or crushing of nests or hatchlings. While a nest monitoring and egg relocation program or a nest mark and avoidance program would reduce these impacts, nests may be inadvertently missed (when crawls are obscured by rainfall, wind, and/or tides) or misidentified as false crawls during daily patrols. In addition, nests may be destroyed by operations at night prior to beach patrols being performed. Even under the best of conditions, about 7 percent of the nests can be misidentified as false crawls by experienced sea turtle nest surveyors (Schroeder 1994).

Potential adverse impacts during the project construction phase include disturbance of existing nests, which may have been missed, disturbance of females attempting to nest, and disorientation of emerging hatchlings. Heavy equipment will be required to install the groins, and this equipment will have to traverse the sandy beach to the project site, which could result in harm to nesting females, nests, and emerging hatchlings. Trenching, which is usually associated with groin construction will not be necessary, due to the highly eroded nature of the beach at the proposed construction site. All construction will occur upon the existing seabed.

Three permanent groins are proposed to be constructed on the south side of Port Everglades south jetty. Two T-groins and one spur are proposed. Following construction, the presence of groin has the potential to impact sea turtles in several ways. They may interfere with nesting turtle access to the beach, result in a change in beach profile and width (downdrift erosion, loss of sandy berms, and escarpment formation), trap hatchlings, and concentrate predators.

1. Nest relocation

Project construction, including both sand placement and groin construction, is likely to occur during the sea turtle nesting season, therefore, impacts due to sea turtle nest relocation is a possibility . Besides the potential for missing nests during a nest relocation program, there is a potential for eggs to be damaged by their movement, particularly if eggs are not relocated within 12 hours of deposition (Limpus *et al*. 1979). Nest relocation can have adverse impacts on incubation temperature (and hence sex ratios), gas exchange parameters, hydric environment of nests, hatching success, and hatchling emergence (Limpus *et al*. 1979, Ackerman 1980, Parmenter 1980, Spotila *et al*. 1983, McGehee 1990). Relocating nests into sands deficient in oxygen or moisture can result in mortality, morbidity, and reduced behavioral competence of hatchlings. Water availability is known to influence the incubation environment of the embryos

and hatchlings of turtles with flexible-shelled eggs, which has been shown to affect nitrogen excretion (Packard *et al*. 1984), mobilization of calcium (Packard and Packard 1986), mobilization of yolk nutrients (Packard *et al*. 1985), hatchling size (Packard *et al*. 1981, McGehee 1990), energy reserves in the yolk at hatching (Packard *et al*. 1988), and locomotory ability of hatchlings (Miller *et al*. 1987).

Comparisons of hatching success between relocated and *in situ* nests have noted significant variation ranging from a 21 percent decrease to a 9 percent increase for relocated nests (Florida Department of Environmental Protection, unpublished data). Comparisons of emergence success between relocated and *in situ* nests have also noted significant variation ranging from a 23 percent decrease to a 5 percent increase for relocated nests (Florida Department of Environmental Protection, unpublished data). A 1994 Florida Department of Environmental Protection study of hatching and emergence success of *in situ* and relocated nests at seven sites in Florida found that hatching success was lower for relocated nests in five of seven cases with an average decrease for all seven sites of 5.01 percent (range = 7.19 percent increase to 16.31 percent decrease). Emergence success was lower for relocated nests in all seven cases by an average of 11.67 percent (range = 3.6 to 23.36 percent) (Meylan 1995).

2. Equipment

The placement of pipelines, groin materials, and the use of heavy machinery or equipment on the beach during a construction project may also have adverse effects on sea turtles. They can create barriers to nesting females emerging from the surf and crawling up the beach, causing a higher incidence of false crawls and unnecessary energy expenditure. The equipment can also create impediments to hatchling sea turtles as they crawl to the ocean.

3. Artificial lighting

Visual cues are the primary sea-finding mechanism for hatchling sea turtles (Mrosovsky and Carr 1967, Mrosovsky and Shettleworth 1968, Dickerson and Nelson 1989, Witherington and Bjorndal 1991). When artificial lighting is present on or near the beach, it can misdirect hatchlings once they emerge from their nests and prevent them from reaching the ocean (Philbosian 1976; Mann 1977; Florida Department of Environmental Protection, unpublished data). In addition, a significant reduction in sea turtle nesting activity has been documented on beaches illuminated with artificial lights (Witherington 1992). Therefore, construction lights along a project beach and on the dredging vessel may deter females from coming ashore to nest, misdirect females trying to return to the surf after a nesting event, and misdirect emergent hatchlings from adjacent non-project beaches. Any source of bright lighting can profoundly affect the orientation of hatchlings, both during the crawl from the beach to the ocean and once they begin swimming offshore. Hatchlings attracted to light sources on dredging barges may not only suffer from interference in migration, but may also experience higher probabilities of predation to predatory fishes that are also attracted to the barge lights. This impact could be reduced by using the minimum amount of light necessary (may require shielding) or low pressure sodium lighting during project construction.

4. Entrapment/physical obstruction

Adult females approaching the nesting beach may encounter the groin structures and either go around them, abort nesting activities for that night, and/or move to another section of beach to

nest. The groins will act as barriers between beach segments and also prevent nesting on the groin alignment. The groins could confuse or misorient nesting or hatchling turtles and prolong their time on the beach, making them vulnerable to predation, exhaustion, or dessication.

The physical obstruction of the T-heads may affect both adult female and hatchling sea turtles. Adult females may be deterred from approaching their preferred nesting locations because of the shore parallel barrier the T-heads pose. The groins and their T-heads may also serve as impediments to offshore migration by hatchlings. Howard and Davis (1999) found that 13 percent of hatchlings emerging from nests laid near T-head groins in Palm Beach County, Florida, encountered the groins on their trek to the ocean. In this case, the project design for sand placement around the groins was not properly followed. The project was designed to have a narrower fill section in the vicinity of the groins so the shore parallel T-heads would be seaward of the high water line and hatchlings would be able to swim over them. However, the groin section received more fill than expected which caused the high water line to be further seaward than expected. As a result, the T-heads trapped hatchlings due to the exposure of the T-heads above the high water line and the presence of artificial lighting in the vicinity of the groins which caused them to disorient in the direction of the T-heads. Therefore, if sand placement or accretion results in exposure of T-heads above the water's surface and/or artificial lighting problems exist in a groin construction area, hatchlings are likely to become trapped.

5. Predator concentration
The presence of groins has the potential to attract and concentrate predatory fishes and provide perching spots for predatory birds, resulting in higher probabilities of hatchling predation as hatchlings enter the ocean.

Indirect Effects

Many of the direct effects of beach nourishment and groin construction may persist over time and become indirect impacts. These indirect effects include increased susceptibility of relocated nests to catastrophic events, the consequences of potential increased beachfront development, changes in the physical characteristics of the beach, the formation of escarpments, future sand migration, accelerated downdrift erosion, and the impacts of debris on the beach from groin breakdown.

1. Increased susceptibility to catastrophic events
Nest relocation may concentrate eggs in an area making them more susceptible to catastrophic events. Hatchlings released from concentrated areas also may be subject to greater predation rates from both land and marine predators, because the predators learn where to concentrate their efforts (Glenn 1998, Wyneken *et al*. 1998).

2. Increased beachfront development
Pilkey and Dixon (1996) state that beach replenishment frequently leads to more development in greater density within shorefront communities that are then left with a future of further replenishment or more drastic stabilization measures. Dean (1999) also notes that the very existence of a beach nourishment project can encourage more development in coastal areas. Following completion of a beach nourishment project in Miami during 1982, investment in new

and updated facilities substantially increased tourism there (National Research Council 1995). Increased building density immediately adjacent to the beach often resulted as older buildings were replaced by much larger ones that accommodated more beach users. Overall, shoreline management creates an upward spiral of initial protective measures resulting in more expensive development which leads to the need for more and larger protective measures. Increased shoreline development may adversely affect sea turtle nesting success. Greater development may support larger populations of mammalian predators, such as foxes and raccoons, than undeveloped areas (National Research Council 1990a), and can also result in greater adverse effects due to artificial lighting, as discussed above.

3. Changes in the physical environment

Beach nourishment may result in changes in sand density (compaction), beach shear resistance (hardness), beach moisture content, beach slope, sand color, sand grain size, sand grain shape, and sand grain mineral content if the placed sand is dissimilar from the original beach sand (Nelson and Dickerson 1988a). These changes could result in adverse impacts on nest site selection, digging behavior, clutch viability, and emergence by hatchlings (Nelson and Dickerson 1987, Nelson 1988).

Beach compaction and unnatural beach profiles that may result from beach nourishment activities could negatively impact sea turtles regardless of the timing of projects. Very fine sand and/or the use of heavy machinery can cause sand compaction on nourished beaches (Nelson *et al*. 1987, Nelson and Dickerson 1988a). Significant reductions in nesting success (i.e., false crawls occurred more frequently) have been documented on severely compacted nourished beaches (Fletemeyer 1980, Raymond 1984, Nelson and Dickerson 1987, Nelson *et al*. 1987), and increased false crawls may result in increased physiological stress to nesting females. Sand compaction may increase the length of time required for female sea turtles to excavate nests and also cause increased physiological stress to the animals (Nelson and Dickerson 1988c). Nelson and Dickerson (1988b) concluded that, in general, beaches nourished from offshore borrow sites are harder than natural beaches, and while some may soften over time through erosion and may accretion of sand, others may remain hard for 10 years or more.

These impacts can be minimized by using suitable sand and by tilling compacted sand after project completion. The level of compaction of a beach can be assessed by measuring sand compaction using a cone penetrometer (Nelson 1987). Tilling of a nourished beach with a root rake may reduce the sand compaction to levels comparable to unnourished beaches. However, a pilot study by Nelson and Dickerson (1988c) showed that a tilled nourished beach will remain uncompacted for up to 1 year. Therefore, the Service requires multi-year (usually three years) beach compaction monitoring and, if necessary, tilling to ensure that project impacts on sea turtles are minimized.

A change in sediment color on a beach could change the natural incubation temperatures of nests in an area, which, in turn, could alter natural sex ratios. To provide the most suitable sediment for nesting sea turtles, the color of the nourished sediments must resemble the natural beach sand in the area. Natural reworking of sediments and bleaching from exposure to the sun would help to lighten dark nourishment sediments; however, the timeframe for sediment mixing and bleaching to occur could be critical to a successful sea turtle nesting season.

4. Escarpment formation

On nourished beaches, steep escarpments may develop along their water line interface as they adjust from an unnatural construction profile to a more natural beach profile (Coastal Engineering Research Center 1984, Nelson *et al*. 1987). In addition, escarpments may develop on the crenulate beaches located between groins as the beaches equilibrate to their final positions. These escarpments can hamper or prevent access to nesting sites (Nelson and Blihovde 1998). Researchers have shown that female turtles coming ashore to nest can be discouraged by the formation of an escarpment, leading to situations where they choose marginal or unsuitable nesting areas to deposit eggs (e.g., in front of the escarpments, which often results in failure of nests due to prolonged tidal inundation). This impact can be minimized by leveling any escarpments prior to the nesting season.

5. Downdrift erosion

Groins, in conjunction with beach nourishment, can help stabilize U.S. East Coast barrier island beaches (Leonard *et al*. 1990). However, groins and breakwaters often result in accelerated beach erosion downdrift of the structures (Komar 1983, National Research Council 1987, U.S. Army Corps of Engineers 1992) and corresponding degradation of suitable sea turtle nesting habitat (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991a, 1991b, 1992). Impacts first are noted and greatest changes are observed close to the structures, but effects eventually may extend great distances along the coast (Komar 1983). Beach nourishment only partly alleviates impacts of groin construction on downdrift beaches (Komar 1983).

Groins operate by blocking the natural littoral drift of sand (Kaufman and Pilkey 1979, Komar 1983). Once sand fills the updrift groin area, some littoral drift and sand deposition on adjacent downdrift beaches occurs due to spillover. But, groins often force the river of sand into deeper offshore water, and sand that previously would have been deposited on downdrift beaches is lost from the system (Kaufman and Pilkey 1979). However, in this instance, the Port Everglades inlet jetties have effectively blocked downdrift sand movement.

6. Groin breakdown

As the groin structures fail and break apart, they spread debris on the beach, which may further impede nesting females from accessing suitable nesting sites (resulting in a higher incidence of false crawls) and trap hatchlings and nesting turtles (U.S. Fish and Wildlife Service 1991a, 1991b, 1992, 1993). As part of the proposed project, 18 to 20 derelict groins are proposed for removal.

<u>Species' response to the proposed action</u>

Beach Nourishment

Ernest and Martin (1999) conducted a comprehensive study to assess the effects of beach nourishment on loggerhead sea turtle nesting and reproductive success. The following findings illustrate sea turtle responses to and recovery from a nourishment project. A significantly larger proportion of turtles emerging on nourished beaches abandoned their nesting attempts than turtles emerging on Control or pre-nourished beaches. This reduction in nesting success was most pronounced during the first year following project construction and is most likely the result

of changes in physical beach characteristics associated with the nourishment project (e.g., beach profile, sediment grain size, beach compaction, frequency and extent of escarpments). During the first post-construction year, the time required for turtles to excavate an egg chamber on the untilled, hard-packed sands of one treatment area increased significantly relative to Control and background conditions. However, in another treatment area, tilling was effective in reducing sediment compaction to levels that did not significantly prolong digging times. As natural processes reduced compaction levels on nourished beaches during the second post-construction year, digging times returned to background levels.

During the first post-construction year, nests on the nourished beaches were deposited significantly farther from both the toe of the dune and the tide line than nests on Control beaches. Furthermore, nests were distributed throughout all available habitat and were not clustered near the dune as they were in the Control. As the width of nourished beaches decreased during the second year, among-treatment differences in nest placement diminished. More nests were washed out on the wide, flat beaches of the nourished treatments than on the narrower steeply sloped beaches of the Control. This phenomenon persisted through the second post-construction year monitoring and resulted from the placement of nests near the seaward edge of the beach berm where dramatic profile changes, caused by erosion and scarping, occurred as the beach equilibrated to a more natural contour.

As with other beach nourishment projects, Ernest and Martin (1999) found that the principal effect of nourishment on sea turtle reproduction was a reduction in nesting success during the first year following project construction. Although most studies have attributed this phenomenon to an increase in beach compaction and escarpment formation, Ernest and Martin indicate that changes in beach profile may be more important. Regardless, as a nourished beach is reworked by natural processes in subsequent years and adjusts from an unnatural construction profile to a more natural beach profile, beach compaction and the frequency of escarpment formation decline, and nesting and nesting success return to levels found on natural beaches.

Groins

Segment III of the project includes the construction of three groins (Figure 2), two T-head structures, and one spur. The two T-head structures will be constructed downdrift of the Port Everglades entrance. The spur will be connected on the south side of the south jetty. The beach immediately south of the Port Everglades entrance has been nourished on two previous occasions. The nourishments have been unsuccessful in maintaining a suitable protective and recreational beach. Therefore, the purpose of the groins is to stabilize the design shoreline and reduce the long-term sand losses at this location. The groins will be of rubble mound construction. The T-head structures will include a T-head at the seaward end. The spacing between the groin stems is approximately 280 feet, and the distance between the T-heads is about 150 feet. Once the sand fill between the groins equilibrates, the seaward limit of the groins will be situated about 60 to 80 feet eastward of the design mean high water shoreline.

According to Olsen Associates, Inc. (Olsen 1999), once a pocket beach has fully equilibrated between two appropriately designed T-head structures, the residual renourished shoreline produces excellent sea turtle nesting habitat. It becomes an area of reduced wave energy, is

usually shallow, and is typically subject to less scarping and benching of the associated beach foreshore. The three groins proposed for placement in John U. Lloyd Beach State Recreation Area may affect sea turtles through potential entrapment of hatchlings in boulder spaces and through an increase in the potential for fish predation on the young hatchlings that emerge from the nest. The groins also provide a positive benefit in providing nesting beach where there was none before.

As part of the proposed action, 18 to 20 derelict groins are proposed for removal. Four structures are located north of the Dania Beach Pier, the remainder are located south of the pier. All are proposed for removal during the nesting season to coincide with the nourishment actions proposed for the Hollywood/Hallandale Beach nourishment component. The removal of the structures provide a positive benefit, because the current structures have the potential to entrap hatchlings.

## CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. The Service is not aware of any cumulative effects in the project area.

## CONCLUSION

After reviewing the current status of the loggerhead, the leatherback, and the green sea turtle, the environmental baseline for the action area, the effects of the proposed beach nourishment, the effects of the groin construction, and the cumulative effects, it is the Service's biological opinion that the beach construction project, as proposed, is not likely to jeopardize the continued existence of these three species, and is not likely to destroy or adversely modify designated critical habitat. However, no critical habitat has been designated for the loggerhead, the leatherback, and the green sea turtle in the continental United States; therefore, none will be affected.

The Service anticipates 11.8 miles (62,304 linear feet) of nesting beach habitat could be affected as a result of the proposed beach nourishment and 0.1 mile (600 linear feet) of nesting habitat could be affected as a result of the proposed groin construction, which is less than one percent of the approximately 1,400 miles of available sea turtle nesting habitat in the southeastern U.S.

Research has shown that the principal effect of beach nourishment on sea turtle reproduction is a reduction in nesting success, and this reduction is most often limited to the first year following project construction. Research has also shown that the impacts of a nourishment project on sea turtle nesting habitat are typically short-term because a nourished beach will be reworked by natural processes in subsequent years, and beach compaction and the frequency of escarpment formation will decline. Research on the effects of groin construction on sea turtle reproduction is very limited, however, these studies have documented that the groins may alter sea turtle

nesting events, that hatchlings may get trapped in the groin structures, and the structures may increase the presence of predatory fish in the groin area.

Although a variety of factors, including some that cannot be controlled, can influence how a beach nourishment and groin construction project will perform from an engineering perspective, measures can be implemented to minimize impacts to sea turtles.

## INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be implemented by the Corps so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps, (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps must report the progress of the action and its impacts on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

### AMOUNT OR EXTENT OF TAKE

The Service anticipates 11.8 miles (62,304 linear feet) of nesting beach habitat could be taken as a result of the proposed beach nourishment and 0.1 mile (600 linear feet) of nesting habitat could be taken as a result of the proposed groin construction. The proposed beach nourishment includes approximately 6.0 miles (31,680 linear feet) scheduled for placement during the "normally closed" March 1 through October 31 summer nesting season, with the remainder of the nourishment, 5.8 miles (30,624 linear feet), scheduled for construction outside the closure period. The new groin construction and the derelict groin removals also expected to occur during the nesting season.

The take for the 5.8 miles (30,624 linear feet), scheduled for construction outside the closure period is expected to be in the form of: (1) destruction of all nests that may be constructed and eggs that may be deposited from March 1 through April 30 and from September 1 through September 30 and missed by a nest survey and egg relocation program within the boundaries of the proposed project; (2) destruction of all nests deposited from October 1 through February 28 (or 29 as applicable) when a nest survey and egg relocation program is not required to be in place within the boundaries of the proposed project; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities; (5) misdirection of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Fish and Wildlife Service.

The take for the 6.0 miles (31,680 linear feet) scheduled for placement during the "normally closed" March 1 through October 31 summer nesting season and the take for the groin construction and removal is expected to be in the form of: (1) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the proposed project; (2) destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the proposed project; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities; (5) behavior modification of nesting females or hatchlings due to the presence of groins, which may act as barriers to movement; (6) behavior modification of nesting females if they dig into shallowly buried groins, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; (7) misdirection of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting; (8) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (9) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Fish and Wildlife Service.

Incidental take is anticipated for only the 11.8 miles (62,304 linear feet) of beach that have been identified for sand placement and the 0.1 mile (600 linear feet) of beach that have been identified for the construction of the groin field. The Service anticipates incidental take of sea turtles will be difficult to detect for the following reasons: (1) the turtles nest primarily at night and all nests are not found because [a] natural factors, such as rainfall, wind, and tides may obscure crawls and [b] human-caused factors, such as pedestrian and vehicular traffic, may obscure crawls, and result in nests being destroyed because they were missed during a nesting survey and egg relocation program; (2) the total number of hatchlings per undiscovered nest is unknown; (3) the reduction in percent hatching and emerging success per relocated nest over the natural nest site is

unknown; (4) an unknown number of females may avoid the project beach and be forced to nest in a less than optimal area; (5) lights may misdirect an unknown number of hatchlings and cause death; and (6) escarpments may form and cause an unknown number of females from accessing a suitable nesting site. However, the level of take of these species can be anticipated by the disturbance and renourishment of suitable turtle nesting beach habitat because: (1) turtles nest within the project site; (2) beach renourishment will likely occur during a portion of the nesting season; (3) groin construction will modify beach profile and width and is likely to increase the presence of escarpments; (4) the renourishment project will modify the incubation substrate, beach slope, and sand compaction; and (5) artificial lighting will deter and/or misdirect nesting females and hatchlings.

## EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species. Critical habitat has not been designated in the project area; therefore, the project will not result in destruction or adverse modification of critical habitat.

## REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of the loggerhead, the leatherback, and the green sea turtle.

For portions of the beach to be constructed outside the "normally closed" March 1 through October 31 summer nesting season (DEP Monuments R36 to R43, R51 to R72, and R86 to R92), the following reasonable and prudent measures are appropriate.

1. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence must be used on the project site.

2. Beach nourishment activities must not occur from March 1 through October 31, the period of peak sea turtle egg laying and egg hatching, to reduce the possibility of sea turtle nest burial or crushing of eggs.

3. If the beach nourishment project will be conducted during the period from March 1 through April 30, surveys for early nesting sea turtles must be conducted. If nests are constructed in the area of beach nourishment, the eggs must be relocated.

4. If the beach nourishment project will be conducted during the period from November 1 through November 30, surveys for late nesting sea turtles must be conducted. If nests are constructed in the area of beach nourishment, the eggs must be relocated.

5. Immediately after completion of the beach nourishment project and prior to the next three nesting seasons, beach compaction must be monitored and tilling must be conducted as required by March 1 to reduce the likelihood of impacting sea turtle nesting and hatching

activities. The March 1 deadline is required to reduce impacts to leatherbacks that nest in greater frequency along the South Atlantic coast of Florida than elsewhere in the continental United States.

6. Immediately after completion of the beach nourishment project and prior to the next three nesting seasons, monitoring must be conducted to determine if escarpments are present and escarpments must be leveled as required to reduce the likelihood of impacting sea turtle nesting and hatching activities.

7. The applicant must ensure that contractors doing the beach nourishment work fully understand the sea turtle protection measures detailed in this incidental take statement.

8. During the nesting season, construction equipment and pipes must be stored in a manner that will minimize impacts to sea turtles to the maximum extent practicable.

9. During the early and late portions of the nesting season, lighting associated with the project must be minimized to reduce the possibility of disrupting and misdirecting nesting and/or hatchling sea turtles.

For portions of the beach to be constructed during the "normally closed" March 1 through October 31 summer nesting season (DEP Monuments R98 to R128), the groin construction, and derelict groin removals, the following reasonable and prudent measures are appropriate.

1. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence must be used on the project site.

2. If the beach nourishment project will be conducted during the sea turtle nesting season, surveys for nesting sea turtles must be conducted. If nests are constructed in the area of beach nourishment, the eggs must be relocated.

3. Immediately after completion of the beach nourishment project and prior to the next three nesting seasons, beach compaction must be monitored and tilling must be conducted as required by March 1 to reduce the likelihood of impacting sea turtle nesting and hatching activities. The March 1 deadline is required to reduce impacts to leatherbacks that nest in greater frequency along the South Atlantic coast of Florida than elsewhere in the continental United States. (NOTE: The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post-construction compaction levels. Also, out-year compaction monitoring and remediation are not required if placed material no longer remains on the beach.)

4. If the groin construction and removal project will be conducted during the sea turtle nesting season, sea turtle protection measures must be employed to minimize the likelihood of take.

5. Immediately after completion of the beach nourishment project and prior to the next three nesting seasons, monitoring must be conducted to determine if escarpments are present and

escarpments must be leveled as required to reduce the likelihood of impacting sea turtle nesting and hatching activities.

6. The applicant must ensure that contractors doing the beach nourishment work fully understand the sea turtle protection measures detailed in this incidental take statement.

7. During the sea turtle nesting season, construction equipment and materials must be stored in a manner that will minimize impacts to sea turtles to the maximum extent practicable.

8. During the sea turtle nesting season, lighting associated with the project must be minimized to reduce the possibility of disrupting and misdirecting nesting and/or hatchling sea turtles.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

For portions of the beach to be constructed outside the "normally closed" March 1 through October 31 summer nesting season (DEP Monuments R36 to R43, R51 to R72, and R86 to R92), the following terms and conditions apply.

1. All fill material placed must be sand that is analogous to a native beach in the vicinity of the site that has not been affected by prior renourishment activities. The fill material must be equivalent in both coloration and grain size distribution to the native beach. All such fill material must be free of construction debris, rocks, or other foreign matter and must not contain, on average, greater than 10 percent fines (i.e., silt and clay) (passing the #230 sieve) and must not contain, on average, greater than 5 percent coarse gravel or cobbles, exclusive of shell material (retained by the #4 sieve).

2. Beach nourishment must be started after October 31 and be completed before March 1. During the March 1 through October 31 period, no construction equipment or pipes will be stored on the beach.

3. If the beach nourishment project will be conducted during the period from March 1 through April 30, daily early morning surveys for sea turtle nests must be conducted from March 1 through April 30 or until completion of the project (whichever is earliest), and eggs must be relocated per the following requirements.

3a. Nesting surveys and egg relocations will only be conducted by personnel with prior experience and training in nesting survey and egg relocation procedures. Surveyors must have a valid FWC permit. Nesting surveys must be conducted daily between sunrise and 9 a.m. Surveys must be performed in such a manner so as to ensure that construction

activity does not occur in any location prior to completion of the necessary sea turtle protection measures.

3b. Only those nests that may be affected by construction activities will be relocated. Nests requiring relocation must be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Nest relocations in association with construction activities must cease when construction activities no longer threaten nests. Nests deposited within areas where construction activities have ceased or will not occur for 65 days must be marked and left in place unless other factors threaten the success of the nest. Any nests left in the active construction zone must be clearly marked, and all mechanical equipment must avoid nests by at least 10 feet.

4. If the beach nourishment project will be conducted during the period from November 1 through November 30, daily early morning sea turtle nesting surveys must be conducted 65 days prior to project initiation and continue through September 30, and eggs must be relocated per the preceding requirements.

5. Immediately after completion of the beach nourishment project and prior to March 1 for 3 subsequent years, sand compaction must be monitored in the area of restoration in accordance with a protocol agreed to by the Service, the State regulatory agency, and the applicant. At a minimum, the protocol provided under 5a and 5b below must be followed. If required, the area must be tilled to a depth of 36 inches. All tilling activity must be completed prior to March 1. An annual summary of compaction surveys and the actions taken must be submitted to the Service. (NOTE: The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post-construction compaction levels. Also, out-year compaction monitoring and remediation are not required if placed material no longer remains on the beach.)

5a. Compaction sampling stations must be located at 500-foot intervals along the project area. One station must be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station must be midway between the dune line and the high water line (normal wrack line).

At each station, the cone penetrometer will be pushed to a depth of 6, 12, and 18 inches three times (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lay over less compact layers. Replicates will be located as close to each other as possible, without interacting with the previous hole and/or disturbed sediments. The three replicate compaction values for each depth will be averaged to produce final values for each depth at each station. Reports will include all 18 values for each transect line, and the final 6 averaged compaction values.

5b. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area must be tilled prior to March 1. If values

exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the Fish and Wildlife Service will be required to determine if tilling is required. If a few values (5 percent) exceeding 500 psi are present randomly within the project area, tilling will not be required.

6. Visual surveys for escarpments along the project area must be made immediately after completion of the beach nourishment project and prior to March 1 for 3 subsequent years. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet must be leveled to the natural beach contour by March 1. If the project is completed during the early part of the sea turtle nesting and hatching season (March 1 through April 30), escarpments may be required to be leveled immediately, while protecting nests that have been relocated or left in place. The Service must be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet occurs during the nesting and hatching season to determine the appropriate action to be taken. If it is determined that escarpment leveling is required during the nesting or hatching season, the Service will provide a brief written authorization that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken must be submitted to the Service. (NOTE: Out-year escarpment monitoring and remediation are not required if placed material no longer remains on the dry beach.)

7. The applicant must arrange a meeting between representatives of the contractor, the Service, the FWC, and the permitted person responsible for egg relocation at least 30 days prior to the commencement of work on this project. At least 10 days advance notice must be provided prior to conducting this meeting. This will provide an opportunity for explanation and/or clarification of the sea turtle protection measures.

8. From March 1 through April 30 and November 1 through November 30, staging areas for construction equipment must be located off the beach to the maximum extent practicable. Nighttime storage of construction equipment not in use must be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes that are placed on the beach must be located as far landward as possible without compromising the integrity of the existing or reconstructed dune system. Temporary storage of pipes must be off the beach to the maximum extent possible. Temporary storage of pipes on the beach must be in such a manner so as to impact the least amount of nesting habitat and must likewise not compromise the integrity of the dune systems (placement of pipes perpendicular to the shoreline is recommended as the method of storage).

9. During sand placement, from March 1 through April 30 and November 1 through November 30, direct lighting of the beach and near shore waters must be limited to the immediate construction area and must comply with safety requirements. Lighting on offshore or onshore equipment must be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the waters surface and nesting beach while meeting all Coast Guard, EM 385-1-1, and OSHA requirements. Light intensity of lighting plants must be reduced to the minimum standard required by OSHA for General

Construction areas, in order not to misdirect sea turtles. Shields must be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area (Figure 3).

10. A report describing the actions taken to implement the terms and conditions of this incidental take statement must be submitted to the South Florida Ecological Services Field Office, Vero Beach, within 60 days of completion of the proposed work for each year when the activity has occurred. This report will include the dates of actual construction activities, names and qualifications of personnel involved in nest surveys and relocation activities, descriptions and locations of self-release beach sites, nest survey and relocation results, and hatching success of nests.

11. In the event a sea turtle nest is excavated during construction activities, the permitted person responsible for egg relocation for the project must be notified so the eggs can be moved to a suitable relocation site.

12. Upon locating a sea turtle adult, hatchling, or egg harmed or destroyed as a direct or indirect result of the project, notification must be made to the FWC Bureau of Marine Enforcement, toll free at (800) 342-5367 and to the South Florida Ecological Services Field Office, Vero Beach, at (561) 562-3909. Care should be taken in handling injured turtles or eggs to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

For portions of the beach to be constructed during the "normally closed" March 1 through October 31 summer nesting season (DEP Monuments R98 to R128), the following terms and conditions apply.

1. All fill material placed must be sand that is analogous to a native beach in the vicinity of the site that has not been affected by prior renourishment activities. The fill material must be equivalent in both coloration and grain size distribution to the native beach. All such fill material must be free of construction debris, rocks, or other foreign matter and must not contain, on average, greater than 10 percent fines (i.e., silt and clay) (passing the #230 sieve) and must not contain, on average, greater than 5 percent coarse gravel or cobbles, exclusive of shell material (retained by the #4 sieve).

2. Daily early morning surveys for sea turtle nests will be required if any portion of the beach nourishment and/or groin construction project occurs during the period from March 1 through November 30. Nesting surveys must be initiated 65 days prior to nourishment activities or by March 1, whichever is later. Nesting surveys must continue through the end of the project or through September 30, whichever is earlier. If nests are constructed in areas where they may be affected by beach nourishment activities, eggs must be relocated per the following requirements.

2a. Nesting surveys and egg relocations will only be conducted by personnel with prior experience and training in nesting survey and egg relocation procedures. Surveyors must have a valid Florida Fish and Wildlife Conservation Commission permit. Nesting

surveys must be conducted daily between sunrise and 9 a.m. Surveys must be performed in such a manner so as to ensure that beach nourishment activity does not occur in any location prior to completion of the necessary sea turtle protection measures.

2b. Only those nests that may be affected by beach nourishment activities will be relocated unless otherwise permitted by the State for conservation purposes. Nests requiring relocation must be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Nest relocations in association with beach nourishment activities must cease when beach nourishment activities no longer threaten nests. Nests deposited within areas where beach nourishment activities have ceased or will not occur for 65 days must be marked and left in place unless other factors threaten the success of the nest. Any nests left in the active construction zone must be clearly marked, and all mechanical equipment must avoid nests by at least 10 feet.

2c. Nests will not be relocated for groin construction purposes unless beach nourishment activities are in progress or will be starting within 65 days. Nests deposited within areas where beach nourishment activities have ceased or will not occur for 65 days must be marked and left in place unless other factors threaten the success of the nest. Any nests left in the groin construction area must be clearly marked. Nests will be marked and the actual location of the clutch determined. A circle with a radius of 10 feet, centered at the clutch, will be marked by stake and survey tape or string. No construction activities will enter this circle and no adjacent construction that might directly or indirectly disturb the area within the staked circle will be allowed.

3. Immediately after completion of the beach nourishment project and prior to March 1 for 3 subsequent years, sand compaction must be monitored in the area of restoration in accordance with a protocol agreed to by the Service, the State regulatory agency, and the applicant. At a minimum, the protocol provided under 3a and 3b below must be followed. If required, the area must be tilled to a depth of 36 inches. All tilling activity must be completed prior to March 1. An annual summary of compaction surveys and the actions taken must be submitted to the Service. (NOTE: The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post-construction compaction levels. Also, out-year compaction monitoring and remediation are not required if placed material no longer remains on the beach.)

3a. Compaction sampling stations must be located at 500-foot intervals along the project area. One station must be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station must be midway between the dune line and the high water line (normal wrack line). At each station, the cone penetrometer will be pushed to a depth of 6, 12, and 18 inches three times (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lay over less compact layers. Replicates will be located as close to each other as possible, without interacting with the previous hole and/or disturbed sediments. The three replicate compaction values for each

depth will be averaged to produce final values for each depth at each station. Reports will include all 18 values for each transect line, and the final 6 averaged compaction values.

3b. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area must be tilled prior to March 1. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the Fish and Wildlife Service will be required to determine if tilling is required. If a few values (5 percent) exceeding 500 psi are present randomly within the project area, tilling will not be required.

4. Visual surveys for escarpments along the project area must be made immediately after completion of the beach nourishment project and prior to March 1 for 3 subsequent years. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet must be leveled to the natural beach contour by March 1. If the project is completed during the early part of the sea turtle nesting and hatching season (March 1 through April 30), escarpments may be required to be leveled immediately, while protecting nests that have been relocated or left in place. The Service must be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed18 inches in height for a distance of 100 feet occurs during the nesting and hatching season to determine the appropriate action to be taken. If it is determined that escarpment leveling is required during the nesting or hatching season, the Service will provide a brief written authorization that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken must be submitted to the Service. (NOTE: Out-year escarpment monitoring and remediation are not required if placed material no longer remains on the dry beach.)

5. The applicant must arrange a meeting between representatives of the contractor, the Service, the FWC, and the permitted person responsible for nest marking and/or egg relocation at least 30 days prior to the commencement of work on this project. At least 10 days advance notice must be provided prior to conducting this meeting. This will provide an opportunity for explanation and/or clarification of the sea turtle protection measures.

6. From March 1 through November 30, staging areas for beach nourishment and groin construction and removal equipment must be located off the beach to the maximum extent practicable. Nighttime storage of construction equipment and materials not in use must be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes and materials that are placed on the beach must be located as far landward as possible without compromising the integrity of the existing or reconstructed dune system. Temporary storage of pipes and other construction materials must be off the beach to the maximum extent possible. Temporary storage of pipes on the beach must be in such a manner so as to impact the least amount of nesting habitat and must likewise not compromise the integrity of the dune systems (placement of pipes perpendicular to the shoreline is recommended as the method of storage).

7. During groin construction and removal, no temporary lighting of the construction area is authorized at anytime during the sea turtle nesting season from April 1 through November 30 with the following exception. Lighting will be allowed if safety lighting is required at any excavated trenches that must remain on the beach at night. This lighting must be limited to the immediate construction area only and must be the minimal lighting necessary to comply with safety requirements.

8. During sand placement, from March 1 through November 30, direct lighting of the beach and near shore waters must be limited to the immediate construction area and must comply with safety requirements. Lighting on offshore or onshore equipment must be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the waters surface and nesting beach while meeting all Coast Guard, EM 385-1-1, and OSHA requirements. Light intensity of lighting plants must be reduced to the minimum standard required by OSHA for General Construction areas, in order not to mis-direct sea turtles. Shields must be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area (Figure 3).

9. No permanent exterior lighting will be installed in association with this construction project.

10. If sand placement or sand accretion results in exposure of the T-heads above the water's surface and/or artificial lighting problems exist in the vicinity of the groin structures, and it is determined that hatchlings are being trapped in the corners of the T-heads as a result, the T-head portions of the groins must be removed immediately.

11. In the event a groin structure fails or begins to disintegrate, all debris and structural material must be removed from the nesting beach area and deposited off-beach immediately. If maintenance of a groin structure is required during the period from March 1 through November 30, no work will be initiated without prior coordination with the South Florida Ecological Services Office.

12 . The groin system must be removed if it is determined to not be effective or to be causing a significant adverse impact to the beach and dune system.

13. A report describing the actions taken to implement the terms and conditions of this incidental take statement must be submitted to the South Florida Ecological Services Office, Vero Beach, within 60 days of completion of the proposed work for each year when the activity has occurred. This report will include the dates of actual construction activities, names and qualifications of personnel involved in nest surveys, marking, and relocation activities; descriptions and locations of self-release beach sites; nest survey, marking, and relocation results; and hatching and emerging success of nests.

14. In the event a sea turtle nest is excavated during construction activities, the permitted person responsible for nest marking and/or egg relocation for the project must be notified so the eggs can be moved to a suitable relocation site.

15. Upon locating a sea turtle adult, hatchling, or egg harmed or destroyed as a direct or indirect result of the project, notification must be made to the FWC Bureau of Marine Species, toll free at (888) 404-FWCC (3922) and to the South Florida Ecological Services Field Office, Vero Beach, at (561) 562-3909. Care should be taken in handling injured turtles or eggs to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

Summary

The Service believes that incidental take will be limited to the 11.8 miles (62,304 linear feet) of beach that have been identified for sand placement and the 0.1 mile (600 linear feet) of beach that have been identified for the construction of the groin field and the removal of the 18 to 20 derelict groins. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The Service believes that no more than the following types of incidental take will result from the proposed action: (1) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the proposed project; (2) destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the proposed project; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities and/or groin presence; (5) behavior modification of nesting females or hatchlings due to the presence of the groins which may act as barriers to movement; (6) behavior modification of nesting females if they dig into shallowly buried groins, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; (7) misdirection of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting; (8) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (9) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Fish and Wildlife Service.

The amount or extent of incidental take for sea turtles will be considered exceeded if the project results in more than a one-time placement of sand on the 11.8 miles (62,304 linear feet) of beach and the one time construction of the groin field in the 0.1 mile (600 linear feet) of beach that have been identified for the construction of the groin field. The amount or extent of incidental take will also be considered exceeded in the project results in more than 20 derelict groins are removed. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Corps must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

## CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Construction activities for this project and similar future projects should be planned, to take place, outside the sea turtle nesting and hatching season.

2. Appropriate native salt-resistant dune vegetation should be established on the restored dunes. The Florida Department of Environmental Protection, Office of Beaches and Coastal Systems, can provide technical assistance on the specifications for design and implementation.

3. Surveys for nesting success of sea turtles should be continued for a minimum of 3 years following beach nourishment to determine whether sea turtle nesting success has been adversely impacted.

4. Educational signs should be placed, where appropriate, at beach access points explaining the importance of the area to sea turtles and/or the life history of sea turtle species that nest in the area.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

## REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Should you have additional questions or require clarification, please contact Allen Webb at (772) 562-3909, extension 246.

Sincerely yours,

James J. Slack
Field Supervisor
South Florida Ecological Services Office

cc.
Servic, Jacksonville, FL (Sandy MacPherson)
FWC, Tallahassee, FL ( Robbin Trindell)
NMFS, Habitat Conservation Division, Miami, FL
NMFS, Protected Resources Division, St. Petersburg, FL
EPA, West Palm Beach, FL

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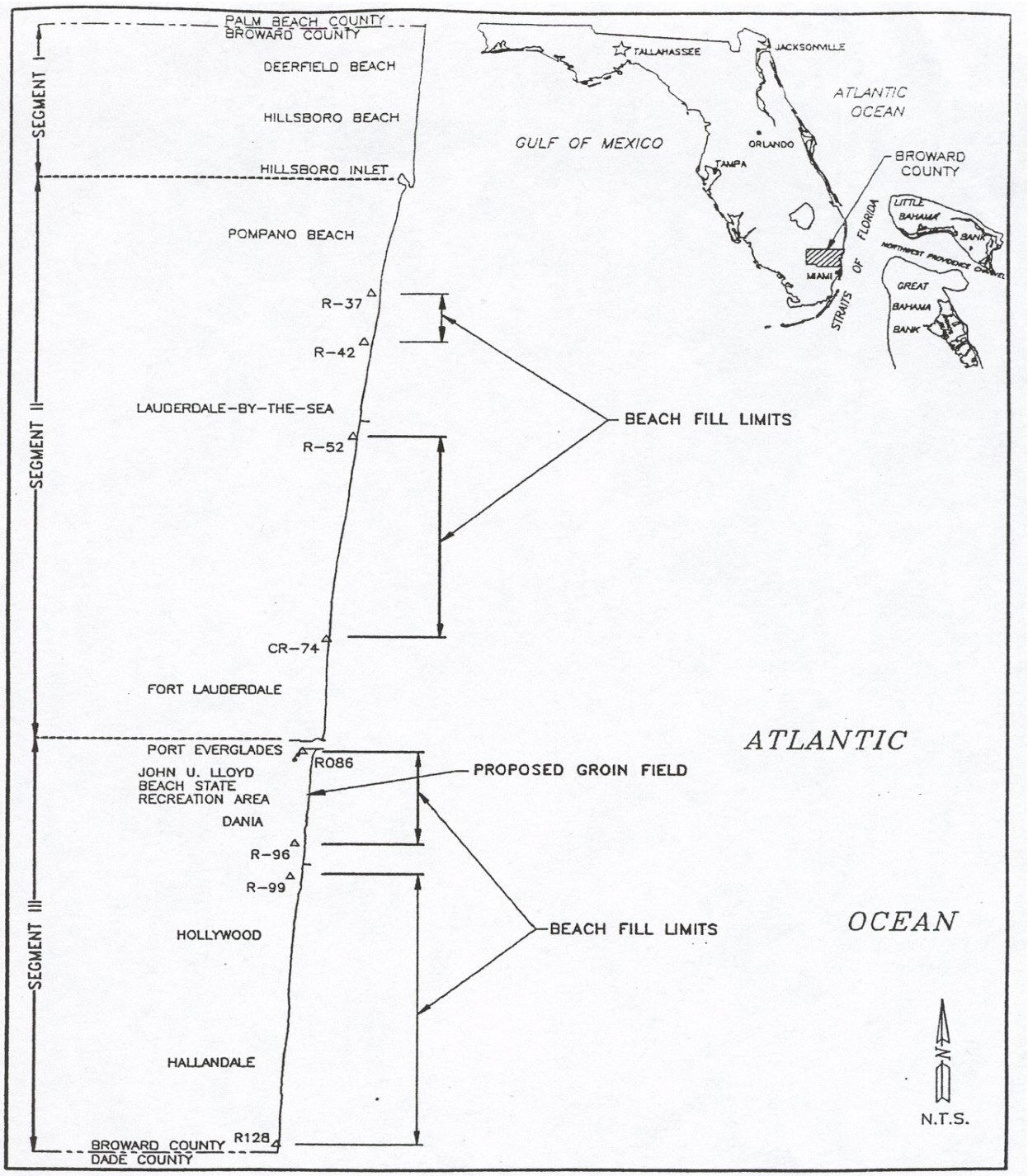
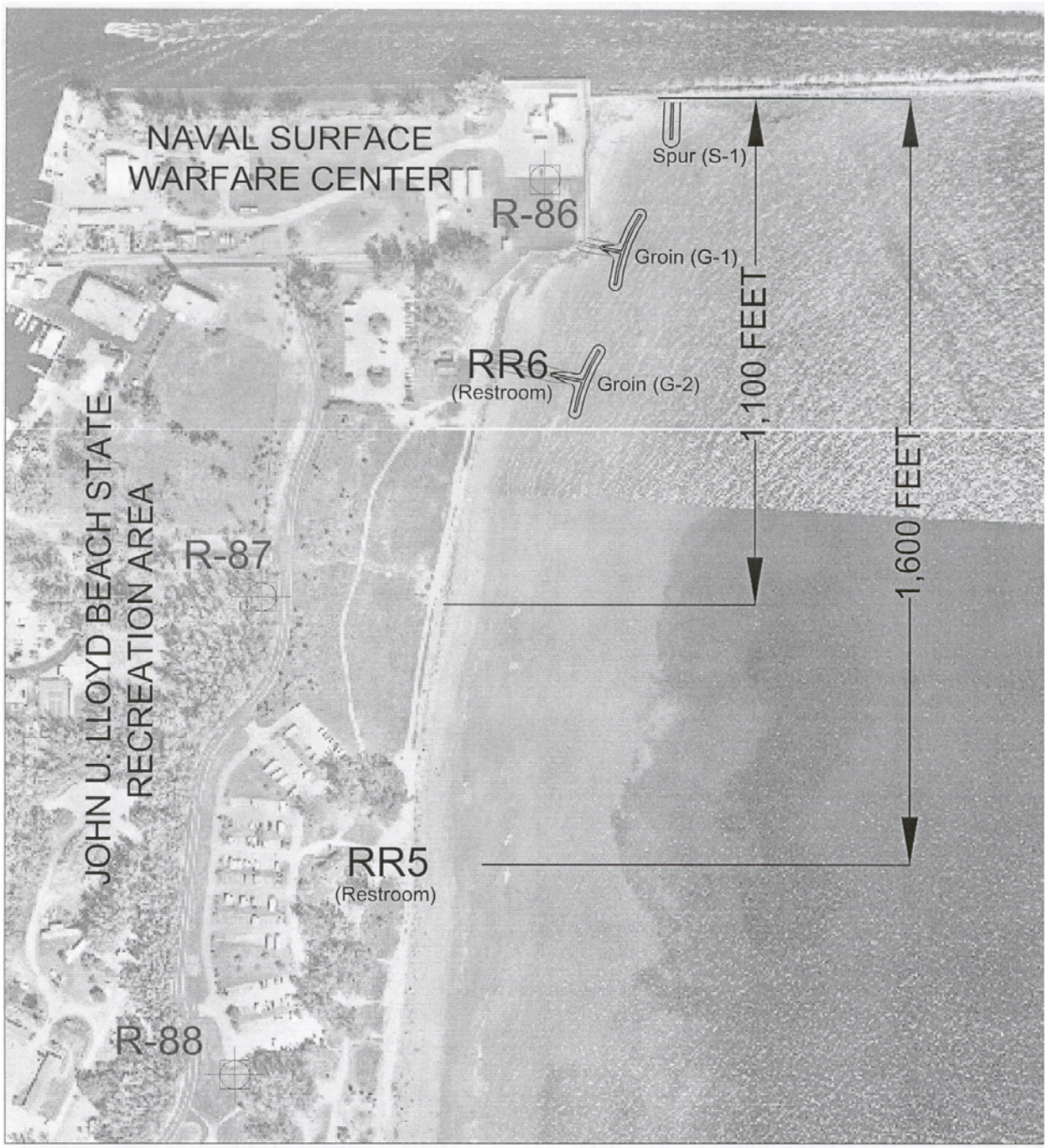
Figure 1




BROWARD COUNTY
LOCATION MAP
AND
SEGMENTS II AND III BEACH FILL LIMITS

Figure 2

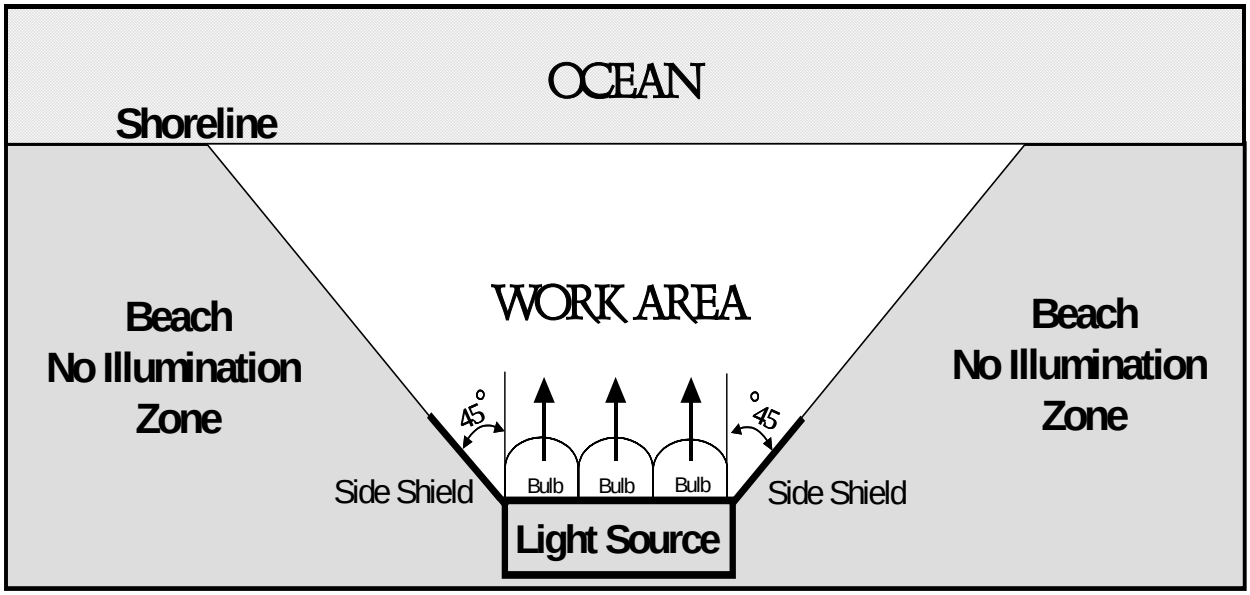


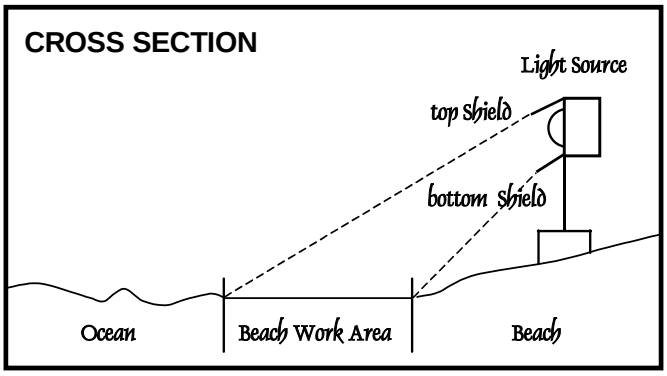

Location of Reaches for
Sea Turtle Nesting Data

olsen associates, inc.

Figure 3

# BEACH LIGHTING SCHEMATIC



**UNITED STATES DEPARTMENT OF COMMERCE**
**National Oceanic and Atmospheric Administration**
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
9721 Executive Center Drive North
St. Petersburg, Florida 33702

April 23, 2002



Mr. James Slack
U.S. Department of the Interior
Fish and Wildlife Service
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

Dear Mr. Slack:

The National Marine Fisheries Service (NMFS) has reviewed your letter, dated March 11, 2002, and the draft Fish and Wildlife Coordination Act Report (CAR) prepared by the U.S. Fish and Wildlife Service (FWS) for the **Broward County Beach Erosion Control and Hurricane Protection Project**. Broward County (County), the local sponsor for the project, proposes to renourish area beaches using county funds and not as part of a Federal project. By letter dated June 26, 2000, the NMFS provided Essential Fish Habitat (EFH) Conservation Recommendations in response to application number 199905545 (IP-DSG) for Department of the Army authorization of the project.

By Federal Register Notice, dated October 29, 1999, the Corps of Engineers (COE) stated its intent to prepare a Draft Environmental Impact Statement (DEIS) for construction of the Broward County Beach Erosion Control and Hurricane Protection Project (Federal Project). The Federal Project involved placement of 3.5 million cubic yards of material along 17.35 miles of Broward County's beaches. The Federal Project would impact approximately 25 acres of nearshore hard bottom habitat, include the construction of 13 shore stabilization groins, and require dredging material from seven borrow areas. Estimates of nearshore marine resource impacts from the Federal Project was based upon hard bottom reef mapping completed for the Coast of Florida Study in 1996[1]. Subsequent reevaluation of the Federal Project and nearshore marine resource within Broward County increased the expected impacts to hard bottom communities to 37.1 acres (COE Public Notice, dated April 26, 2000). As a result of considerable involvement by Federal and state resource agencies, the Federal Project was revised to minimize impacts to nearshore hard bottom communities by reducing the volume and placement of fill on the beach. In addition, the number of proposed borrow areas was

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[1]U.S. Army Corps of Engineers. 1996. Coast of Florida Erosion and storm effects study: region III with final environmental impact statement. ACOE Tech. Rep., Jacksonville District. 62 pp. plus appendices A-I.

reduced to five, and the sizes and configurations of these remaining borrow areas were modified. The revised project is being proposed as the Preferred Alternative for the Broward County Beach Erosion Control and Hurricane Protection Project.

According to the CAR, the Preferred Alternative involves dredging material within five offshore borrow areas and placing approximately 2.5 million cubic yards of sand on 11.8 miles of beach shoreline on the Atlantic Ocean in Broward County, Florida. Two segments of a three segment, Federally-authorized project are proposed for nourishment. Segment II involves fill placement from Hillsboro Inlet to Port Everglades and Segment III from Port Everglades to the south County line. In addition, the proposed project includes construction of three rock groins in Segment III, south of the Port Everglades entrance. Expected nearshore hard bottom impacts for Segment II has been reduced from 12.1 acres in the Federal Project to 6.0 acres in the Preferred Alternative. All impacts to nearshore hard bottom habitats for Segment II are expected to result from "secondary" impacts (i.e. subsequent burial due to equilibration of sand, or "equilibrium toe of the fill"). The County estimates the secondary impacts to occur gradually over a one to three year period. Expected nearshore hard bottom/worm rock reef impacts for Segment III has been reduced from 16.4 acres in the Federal Project to 7.6 acres in the Preferred Alternative. Direct impacts to nearshore hard bottom and worm rock habitat for Segment III are expected to be approximately 0.9 acre and 1.1 acres, respectively. The remaining loss of 6.5 acres of hard bottom habitat is expected to result from "secondary" impacts of the "equilibrium toe of the fill."

The proposed borrow areas for the project were reduced from seven in the Federal Project, to five in the Preferred Alternative. Revisions to the size and boundaries of the remaining five borrow areas were based upon additional resource mapping of the area that revealed previously unidentified hard bottom habitat and seagrass beds within, and adjacent to the borrow areas. To avoid direct and secondary impacts to the adjacent benthic resources, the NMFS and FWS had previously recommended approximately 400- to 500-foot-wide buffer distances between the borrow areas and well developed hard bottom communities. Generally, the hard bottom communities located seaward of the borrow areas (i.e. eastern boundaries) contain higher relief structure and higher percentage of hard and soft corals than the hard bottom communities located landward of the borrow areas. The average buffer distance for the western boundaries of the five borrow areas are: 357 feet for Borrow Area 1; 285 feet for Borrow Area 2; 375 feet for Borrow Area 3; 361 feet for Borrow Area 4; and 235 feet for Borrow Area 6. The average buffer distance for the eastern boundaries of the five borrow areas are: 513 feet for Borrow Area 1; 1,718 feet for Borrow Area 2; 671 feet for Borrow Area 3; 512 feet for Borrow Area 4; and 680 feet for Borrow Area 6.

According to the CAR, impacts are expected to occur to hard bottom communities as a result of placement of the eight proposed pipelines. Impacts to hard bottom habitats are typically caused by direct placement of the pipeline and lateral scraping of the pipeline during installation and removal and movement caused by wave energy. The County proposes to minimize hard bottom impacts by locating the pipeline corridor within areas of low soft and hard coral diversity and density, and the use of tires or H-frame supports to elevate the pipe over the reef. Total impacts to hard bottom communities from the pipeline corridor have been estimated at 0.03 acre.

Total direct and indirect impacts to hard bottom communities from the Preferred Alternative are projected to be 13.6 acres, with 11.6 acres of impacts due to "secondary effects" (i.e. "equilibrium toe of the fill") and expected to occur gradually over a one to three year period. To compensate for these adverse impacts, the County and COE propose to construct a13.5 acre artificial reef constructed from 5-foot-wide limestone boulders. The proposed artificial reefs are expected to provide a 3-foot-vertical relief capable of colonizing and supporting hard bottom communities. To compensate for the loss of productivity and habitat availability incurred during the period between elimination and establishment of a replacement hard bottom community, the County and the COE propose to construct six acres of artificial reef during the spring and/or summer of 2002. The remaining 7.5 acres of artificial reef would be constructed within two to three years following the completion of the project. This proposal is expected to provide available substrate for colonization of marine organisms approximately six months prior to the start of construction and direct impacts to two acres of hard bottom communities, and approximately one to three years prior to impact to 11.6 acres of hard bottom communities from "secondary" effects of the project.

To address "secondary" effects and unexpected direct impacts from the proposed project, the County and COE propose to conduct turbidity and sedimentation monitoring, as well as biological monitoring of the marine benthic communities. Turbidity monitoring, as required for State water quality standards and permit requirements, will be conducted in the area of the beach fill. To assess potential "secondary" effects to hard bottom reefs adjacent to the five borrow areas, multiple monitoring stations will be established on both east and west boundaries of the borrow areas. Each station will include three sample quadrants and collect sediment accumulation samples (i.e. plates), photographic records, and assess stress levels on sample coral colonies. Weekly monitoring is proposed eight weeks prior to construction and during construction, and once every two weeks following completion of the project. Post-construction monitoring is proposed at six months and one year following the completion of the project. Sediment accumulation samples will be used to assess the degree of sediment that has been transported to the reefs from the adjacent to the borrow areas. If the average accumulated sediment exceeds 1.5 mm/week, the use of that individual borrow area will be prohibited until average weekly readings fall below the threshold. Additionally, two sediment accumulation jars will be installed at each borrow area and used to assess sediment accumulation rates (i.e. mg/cm$^2$/day) during 60 intervals. These data will be compared to weekly sediment accumulation samples and correlated with published sediment accumulation levels and coral stress indicators.

The NMFS supports the recommendations provided by the FWS on pages 46 and 47 of the draft CAR. Specifically, the NMFS concurs with the following recommendations:

**1. Short-term sedimentation and biological monitoring at the nearshore hard bottom reefs.** The monitoring protocols established for the hard bottom reefs adjacent to the borrow areas should be conducted for the hard bottom reefs adjacent to the beach fill area, as well. Sediment accumulation data and biological monitoring should be used to assess potential short-term adverse impacts to hard bottom communities east of the "equilibrium toe of the fill." Thresholds similar to the offshore reef assessment should be established to avoid additional adverse impacts to nearshore hard bottom reefs. The nearshore monitoring should include pre- and during-construction sampling, as well as post-construction sampling.

**2. Long-term sedimentation and biological monitoring at the nearshore hard bottom.** To assess potential long-term sediment and turbidity effects and degradation of the nearshore hard bottom reefs, monitoring stations should be established east of the "equilibrium toe of the fill." These stations should be conducted quarterly for the first year following completion of the construction, semi-annually for the second year, and annually for the third and fourth year. In addition, the existing monitoring plan for offshore reef monitoring terminates at one year following completion of construction. Sedimentation and turbidity stress indicators may not necessarily be observed or visible during the first year following project completion. Therefore, the NMFS recommends that the monitoring plan for the offshore reefs continue for four years following project completion.

**3. Long-term sedimentation and biological monitoring at specific coral reef stations.** A number of exceptionally heathy reef sites were identified in Broward County by resource agencies and non-governmental organizations during the review of the Broward County Beach Erosion Control and Hurricane Protection Project. Specifically, unique and healthy stands of staghorn coral (*Acropora cervicornis*) were identified and inspected by NMFS and FWS staff. Although this site is located approximately 1,500 feet east of the proposed fill area, numerous concerns have been expressed from the public and non-governmental organizations regarding potential secondary impacts to these and other ecologically important coral reef sites in Broward County. As an example, the staghorn coral stands located in Broward County represents a healthy population during a period of decline in the distribution and abundance of this species throughout Florida and the Caribbean. In addition, researchers at Nova Southeastern University have documented the first spawning event of this species in Broward County in the late summer of 2001. We concur with FWS' recommendations that these sites should be included in the sedimentation and biological monitoring plan.

**4. Cumulative Effects.** The NMFS concurs with recommendations by the FWS regarding the need to assess the regional evaluation of cumulative impacts to nearshore and offshore hard bottom and coral reefs from repeated dredge and fill projects along the southeast Florida coast. We agree that the COE should conduct a Programmatic Environmental Impact Statement (PEIS) to assess these long-term, cumulative effects to the marine ecosystem in southeast Florida.

Finally, we note the following technical errors in the draft CAR:

- Page 11, "(*Balistes carpiscus*)" should be changed to "(*Balistes capriscus*)".
- Page 11, the family of grunts should be changed to Haemulidae, rather than Pomadasydae (see Robins *et al.* 1986[2] and AFS 1991[3]).

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[2]Robins, C.R. and G.C. Ray. 1986. A field guide to Atlantic coast fishes of North America. Houghton Mifflin Company. 354 pp.

[3]Robins, C.R., R.M. Bailey, C.E. Bond, J.R. Brooker, E.A. Lachner, R.N. Lea, and W.B. Scott. 1991. Common and scientific names of fishes from the United States and Canada. American Fisheries Society Special Publ. 20. 183 pp.

- Page 51, Kolemainen 1978 is alphabetically misplaced in the *Literature Cited* section.

We appreciate the opportunity to provide these comments. Related correspondence should be addressed to the attention of Mr. Mike Johnson at our Miami Office. He may be reached at 11420 North Kendall Drive, Suite #103, Miami, Florida 33176, or by telephone at (305) 595-8352.

Sincerely,

David H. Hankla

for Andreas Mager, Jr.
Assistant Regional Administrator
Habitat Conservation Division

cc:
F/SER3
F/SER4
F/SER43-Johnson

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P. O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019



REPLY TO
ATTENTION OF

Planning Division
Environmental Branch

MAY 14 2002

Mr. James Slack
South Florida Ecological Services Office
1339 20th Street
Vero Beach, FL 32960

Dear Mr. Slack:

This letter is in reference to the Draft Fish and Wildlife Coordination Act Report for the Broward County Shore Protection Project, Segments II and III, Broward County, Florida.

The draft report prepared by your office has been reviewed by my staff and it has been determined that we have no further comments.

We look forward to receiving the final report. Any questions regarding this subject can be directed to Ms. Yvonne Haberer at 904-232-1701.

Sincerely,

James C. Duck

James C. Duck
Chief, Planning Division